OPTICAL DISK UNIT AND METHOD FOR ADJUSTING FOCUS BIAS OF OPTICAL DISK UNIT

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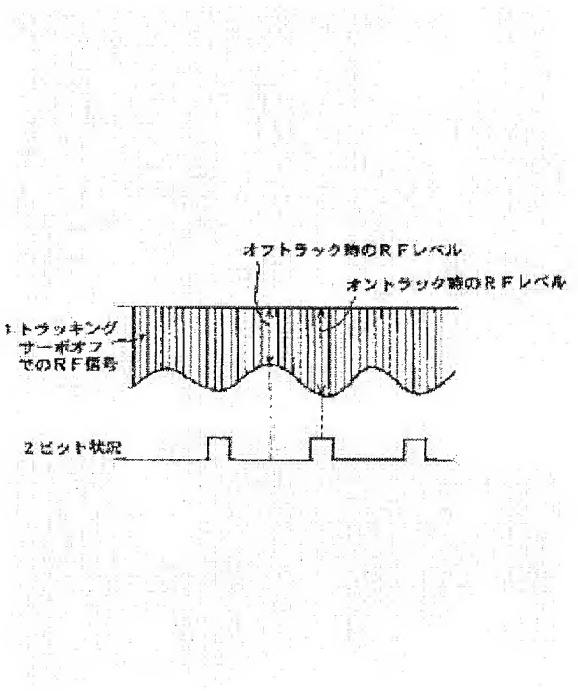
Abstract of **JP2002312959**

PROBLEM TO BE SOLVED: To realize an optical disk unit in which a focus bias can be automatically and accurately adjusted in a short time. SOLUTION: In this optical disk drive having an adjusting means for automatically adjusting a focus bias on the basis of the level of a reproduced RF signal, the adjusting means is provided with a sampling means for sampling a reproduced RF signal level 1 a plurality of times, and an upper value balancing means for calculating a plurality of average values of upper values in the reproduced RF signal level 1 sampled by a plurality of times, and a focus bias value with which the average values calculated by the upper value balancing means become the largest is used as an adjusted value.



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CLAIMS

[Claim(s)]
[Claim 1] In the optical disk unit which has the adjustment device which performs regulating [of focal bias] automatically based on the level of a playback RF signal said adjustment device The sampling means which carries out the multiple-times sampling of said playback RF signal level, It has a high order value average means to compute the average of high order value plurality in said playback RF signal level by which the multiple-times sampling was carried out with this sampling means. The optical disk unit characterized by adopting as a value which had the focal bias value to which the average value which the value average means besides computed becomes the largest adjusted.
[Claim 2] In the focal bias-compensation approach of the optical disk unit which carries out regulating automatically of the focal bias based on the level of a playback RF signal The sampling process which carries out the multiple-times sampling of said playback RF signal level, The high order value average process which computes the average of high order value plurality in said playback RF signal level by which the multiple-times sampling was carried out in this sampling process, The focal bias-compensation approach of the optical disk unit characterized by having the focal bias value selection process adopted as a value in which the focal bias value to which the average value besides computed in a value average process becomes the largest was adjusted.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the focal bias-compensation approach of the optical disk unit with which the adjustment precision of focal bias can shorten time amount which adjustment takes highly, and an optical disk unit especially about the focal bias-compensation approach of an optical disk unit and an optical disk unit.
[0002]
[Description of the Prior Art] in order that the lightwave signal reading block of an optical disk unit may perform laser beam convergence with a sufficient precision and may make a laser spot focus punctiform voice in respect of a disk -- focal tone ** of the direction of a focus -- the so-called focal bias compensation is performed by the mechanism adjustment approach for every device at the time of the assembly of equipment. Furthermore, in the actual optical disk unit, it is carrying out by combining electric adjustment of focal bias for every disk.
[0003] Usually, focal bias compensation as an optical disk unit is performed by adjusting so that a focal servo loop and a tracking servo loop may be closed, the peak-to-peak amplitude of the playback RF signal which the detector formed in the lightwave signal reading block detects may become large and the situations (error situation etc.) of signal reading may become good. However, it may be difficult if drawing in of a tracking servo does not raise the adjustment precision in a lightwave signal reading block depending on the optical method of a lightwave signal reading block.
[0004] Then, before drawing a tracking servo loop, the method of performing focal bias compensation was, but since a tracking servo was still lengthened in order to perform focal bias compensation in this phase, and it was not coming, measurement (measurement of 3T level etc.) of a jitter was difficult, and this had become the cause which adjustment precision does not go up.
[0005]
[Problem(s) to be Solved by the Invention] Like ****, before focal bias compensation of the conventional optical disk unit drew the tracking servo loop, it was performed based on the amplitude of a playback RF signal in many cases, but in order that the amplitude of a playback RF signal might receive the modulation of RE ** RU by the eccentricity and face deflection of a disk, exact level measurement had the problem that it was difficult and adjustment took time amount. This invention solves this problem by the comparatively easy approach, and makes a technical problem comparatively implementation of the focal bias-compensation approach of the optical disk unit in which regulating [of focal bias] automatically is possible, and an optical disk unit correctly for a short time.
[0006]
[Means for Solving the Problem] In the optical disk unit which has the adjustment device with which this invention performs regulating [of focal bias] automatically based on the level of a playback RF signal in order to attain the above-mentioned technical problem said adjustment device The sampling means which carries out the multiple-times sampling of said playback RF signal level, It has a high order value average means to compute the average of high order value

plurality in said playback RF signal level by which the multiple-times sampling was carried out with this sampling means. It is characterized by adopting as a value which had the focal bias value to which the average value which the value average means besides computed becomes the largest adjusted. Thereby, processing for regulating [of focal bias] automatically can be simplified and the optical disk unit in which regulating [of focal bias] automatically is possible can be realized correctly in a short time.

[0007] Moreover, it sets to the focal bias-compensation approach of the optical disk unit which carries out regulating automatically of the focal bias based on the level of a playback RF signal. The sampling process which carries out the multiple-times sampling of said playback RF signal level, The high order value average process which computes the average of high order value plurality in said playback RF signal level by which the multiple-times sampling was carried out in this sampling process, It is characterized by having the focal bias value selection process adopted as a value in which the focal bias value to which the average value besides computed in a value average process becomes the largest was adjusted. Thereby, processing for regulating [of focal bias] automatically can be simplified and the focal bias-compensation approach of the optical disk unit which can adjust focal bias can be realized correctly in a short time.

[0008]

[Embodiment of the Invention] Hereafter, an accompanying drawing is made reference and the focal bias-compensation approach of the optical disk unit concerning this invention and an optical disk unit is explained to a detail.

[0009] First, the focal bias-compensation approach of the optical disk unit of this invention is explained. As stated above, focal bias compensation in a set is usually performed by adjusting so that a focal servo loop and a tracking servo loop may be closed, the peak-to-peak amplitude of the playback RF signal which the detector formed in the lightwave signal reading block detects may become large and the situations (error situation etc.) of signal reading may become good. However, it may be difficult if drawing in of a tracking servo does not raise the adjustment precision in a lightwave signal reading block depending on the optical method of a lightwave signal reading block.

[0010] In order to avoid this problem, before drawing a tracking servo loop, how to perform focal bias compensation can be considered, but in this phase, since a tracking servo is still lengthened and it is not coming, measurement (measurement of 3T level etc.) of the jitter for performing focal bias compensation is difficult. Therefore, the method of seeing the amplitude of a playback RF signal and performing focal bias compensation is common. However, in order that the amplitude of a RF signal may receive the modulation of RE ** RU by the eccentricity and face deflection of a disk in the case where such tracking is not performed, exact level measurement is difficult. So, in this invention, playback RF level is sampled and it is aiming at avoiding this problem by taking the average of the high order value of that peak-to-peak amplitude data.

[0011] The playback RF signal wave form at the time of tracking servo-off and the situation of the pit at that time are shown in drawing 1 . In drawing 1 , a sign 1 is a playback RF signal and a sign 2 is in the situation of the pit on a disk. At the time of tracking servo-off, in the time of the off-track shifted, RF-signal signal level differs greatly, and the level of a playback RF signal becomes large at the time of an on-truck, and it becomes smaller than the time of an on-truck from the time of the on-truck which hit the pit 2, and a pit 2 at the time of an off-track so that drawing 1 may show. What is necessary is to average only the level at the time of an on-truck for focal bias compensation. Then, it means arranging in descending the data of peak-to-peak level with which the playback RF signal was sampled, and carrying out averaging of the data only at the time of an on-truck by averaging only the level data of a high order.

[0012] The flow chart of focus servo ********** with which this invention is applied is shown in drawing 2 . Moreover, the subroutine flow chart of regulating [of the focal bias in the flow chart of drawing 2] automatically is shown in drawing 3 . Moreover, the flow chart of an example of the playback RF level measurement subroutine by sampling is shown in drawing 4 . First, the whole focus servo actuation is explained along with drawing 2 . If a flow chart starts at step 100, offset will be adjusted at step 101, a focus servo will be turned on at step 102, and a tracking servo will be made off. Next, focal bias compensation is performed by the approach shown in

drawing 3 at step 103. Then, a tracking servo is turned ON at step 104, and if it confirms whether detection of a jitter is possible and is not detected at step 105, a detection location is changed at step 106 and it returns to step 103. When detection of a jitter is completed, focal bias is tuned finely and determined at step 107, further, tracking balance is adjusted at step 108, focal gain and tracking gain are determined at step 109, and focus servo actuation is ended at step 110.

[0013] Next, along with drawing 3 , the subroutine of focal bias compensation in step 103 is explained. If this subroutine starts at step 200, focal bias will be changed to a unit 5% at step 201 from −20% of current value to +20% of value. Then, playback RF level is measured by the approach of this invention shown in drawing 4 at step 202 to that each bias of a focus. Then, the point of focal bias with which playback RF level serves as max by 203 among the focal bias of 5% unit from −20% of steps to +20% is chosen. Here, when there are two or more points with which playback RF level serves as max, the bias near 0% is chosen. Then, it is decided that it will be the value of the point which had focal bias chosen at step 204, and this subroutine is ended at step 205.

[0014] Next, along with drawing 4 , the subroutine of playback RF level measurement at step 202 is explained. If this subroutine starts at step 300, spacing of 40ms of playback RF level data will be sampled 400 times at step 301. Then, the average of the data of 32 high orders is calculated at step 302 out of these 400 sampling data. However, except the data of the two most significants and they are not used in order to avoid the effect of a pulse-noise. Then, this average value is made into the playback RF level central value at this measurement time at step 303, and this subroutine is ended at step 304.

[0015] In this invention, by choosing the level at the time of an on-truck automatically, and changing a focal bias value by making the average value into playback RF level central value by choosing the large sampling value of playback RF level in this way, the focal bias value to which playback RF level central value becomes large most is found, and it is made into the focal bias best point. It becomes possible to choose the best focal bias value automatically and to set it up correctly, by this, for a short time.

[0016] As mentioned above, although the focal bias-compensation approach of the optical disk unit of this invention was explained, also let an optical disk unit equipped with a sampling means of playback RF signal level by which such a focal bias-compensation approach is realizable, and a high order value average means to compute the average value of the high order value in the sampled playback RF signal level be the object of this invention.

[0017]

[Effect of the Invention] As explained above, invention of claim 1 of this invention In the optical disk unit which has the adjustment device which performs regulating [of focal bias] automatically based on the level of a playback RF signal The sampling means which carries out the multiple-times sampling of the playback RF signal level at an adjustment device, A high order value average means to compute the average of high order value plurality in the sampled playback RF signal level is established, and it is characterized by adopting the focal bias value to which this computed average becomes the largest as an adjustment value. The adjustment precision of focal bias can be improved by this, and the optical disk unit [regulating / of exact focal bias / automatically is possible and] which can shorten the time amount of regulating [of focal bias] automatically since the optical disk unit which can be improved by the precision of regulating [of focal gain] automatically and tracking gain regulating automatically can be realized in connection with it and the processing for regulating [of focal bias] automatically becomes easy further can be realized.

[0018] In the focal bias-compensation approach of an optical disk unit that invention of claim 2 carries out regulating automatically of the focal bias based on the level of a playback RF signal The sampling process which carries out the multiple-times sampling of the playback RF signal level, The high order value average process which computes the average of high order value plurality in the playback RF signal level sampled in this sampling process, It is characterized by having the focal bias value selection process which adopts the focal bias value to which the average value besides computed in the value average process becomes the largest as an

adjustment value. Thereby, the adjustment precision of focal bias can be improved, regulating [of exact focal bias] automatically is possible, it is possible for the precision of regulating [of focal gain] automatically and tracking gain regulating automatically to also improve in connection with this, and the focal bias-compensation approach of an optical disk unit that time amount of regulating [of focal bias] automatically can be short-****(ed) can be realized.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the focal bias-compensation approach of the optical disk unit with which the adjustment precision of focal bias can shorten time amount which adjustment takes highly, and an optical disk unit especially about the focal bias-compensation approach of an optical disk unit and an optical disk unit.

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PRIOR ART

[Description of the Prior Art] in order that the lightwave signal reading block of an optical disk unit may perform laser beam convergence with a sufficient precision and may make a laser spot focus punctiform voice in respect of a disk -- focal tone ** of the direction of a focus -- the so-called focal bias compensation is performed by the mechanism adjustment approach for every device at the time of the assembly of equipment. Furthermore, in the actual optical disk unit, it is carrying out by combining electric adjustment of focal bias for every disk.
[0003] Usually, focal bias compensation as an optical disk unit is performed by adjusting so that a focal servo loop and a tracking servo loop may be closed, the peak-to-peak amplitude of the playback RF signal which the detector formed in the lightwave signal reading block detects may become large and the situations (error situation etc.) of signal reading may become good. However, it may be difficult if drawing in of a tracking servo does not raise the adjustment precision in a lightwave signal reading block depending on the optical method of a lightwave signal reading block.
[0004] Then, before drawing a tracking servo loop, the method of performing focal bias compensation was, but since a tracking servo was still lengthened in order to perform focal bias compensation in this phase, and it was not coming, measurement (measurement of 3T level etc.) of a jitter was difficult, and this had become the cause which adjustment precision does not go up.

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, invention of claim 1 of this invention In the optical disk unit which has the adjustment device which performs regulating [of focal bias] automatically based on the level of a playback RF signal The sampling means which carries out the multiple-times sampling of the playback RF signal level at an adjustment device, A high order value average means to compute the average of high order value plurality in the sampled playback RF signal level is established, and it is characterized by adopting the focal bias value to which this computed average becomes the largest as an adjustment value. The adjustment precision of focal bias can be improved by this, and the optical disk unit [regulating / of exact focal bias / automatically is possible and] which can shorten the time amount of regulating [of focal bias] automatically since the optical disk unit which can be improved by the precision of regulating [of focal gain] automatically and tracking gain regulating automatically can be realized in connection with it and the processing for regulating [of focal bias] automatically becomes easy further can be realized.
[0018] In the focal bias-compensation approach of an optical disk unit that invention of claim 2 carries out regulating automatically of the focal bias based on the level of a playback RF signal The sampling process which carries out the multiple-times sampling of the playback RF signal level, The high order value average process which computes the average of high order value plurality in the playback RF signal level sampled in this sampling process, It is characterized by having the focal bias value selection process which adopts the focal bias value to which the average value besides computed in the value average process becomes the largest as an adjustment value. Thereby, the adjustment precision of focal bias can be improved, regulating [of exact focal bias] automatically is possible, it is possible for the precision of regulating [of focal gain] automatically and tracking gain regulating automatically to also improve in connection with this, and the focal bias-compensation approach of an optical disk unit that time amount of regulating [of focal bias] automatically can be short-****(ed) can be realized.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Like ****, before focal bias compensation of the conventional optical disk unit drew the tracking servo loop, it was performed based on the amplitude of a playback RF signal in many cases, but in order that the amplitude of a playback RF signal might receive the modulation of RE ** RU by the eccentricity and face deflection of a disk, exact level measurement had the problem that it was difficult and adjustment took time amount. This invention solves this problem by the comparatively easy approach, and makes a technical problem comparatively implementation of the focal bias-compensation approach of the optical disk unit in which regulating [of focal bias] automatically is possible, and an optical disk unit correctly for a short time.

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MEANS

[Means for Solving the Problem] In the optical disk unit which has the adjustment device with which this invention performs regulating [of focal bias] automatically based on the level of a playback RF signal in order to attain the above-mentioned technical problem said adjustment device The sampling means which carries out the multiple-times sampling of said playback RF signal level, It has a high order value average means to compute the average of high order value plurality in said playback RF signal level by which the multiple-times sampling was carried out with this sampling means. It is characterized by adopting as a value which had the focal bias value to which the average value which the value average means besides computed becomes the largest adjusted. Thereby, processing for regulating [of focal bias] automatically can be simplified and the optical disk unit in which regulating [of focal bias] automatically is possible can be realized correctly in a short time.
[0007] Moreover, it sets to the focal bias-compensation approach of the optical disk unit which carries out regulating automatically of the focal bias based on the level of a playback RF signal. The sampling process which carries out the multiple-times sampling of said playback RF signal level, The high order value average process which computes the average of high order value plurality in said playback RF signal level by which the multiple-times sampling was carried out in this sampling process, It is characterized by having the focal bias value selection process adopted as a value in which the focal bias value to which the average value besides computed in a value average process becomes the largest was adjusted. Thereby, processing for regulating [of focal bias] automatically can be simplified and the focal bias-compensation approach of the optical disk unit which can adjust focal bias can be realized correctly in a short time.
[0008]
[Embodiment of the Invention] Hereafter, an accompanying drawing is made reference and the focal bias-compensation approach of the optical disk unit concerning this invention and an optical disk unit is explained to a detail.
[0009] First, the focal bias-compensation approach of the optical disk unit of this invention is explained. As stated above, focal bias compensation in a set is usually performed by adjusting so that a focal servo loop and a tracking servo loop may be closed, the peak-to-peak amplitude of the playback RF signal which the detector formed in the lightwave signal reading block detects may become large and the situations (error situation etc.) of signal reading may become good. However, it may be difficult if drawing in of a tracking servo does not raise the adjustment precision in a lightwave signal reading block depending on the optical method of a lightwave signal reading block.
[0010] In order to avoid this problem, before drawing a tracking servo loop, how to perform focal bias compensation can be considered, but in this phase, since a tracking servo is still lengthened and it is not coming, measurement (measurement of 3T level etc.) of the jitter for performing focal bias compensation is difficult. Therefore, the method of seeing the amplitude of a playback RF signal and performing focal bias compensation is common. However, in order that the amplitude of a RF signal may receive the modulation of RE ** RU by the eccentricity and face deflection of a disk in the case where such tracking is not performed, exact level measurement is difficult. So, in this invention, playback RF level is sampled and it is aiming at avoiding this

problem by taking the average of the high order value of that peak-to-peak amplitude data.
[0011] The playback RF signal wave form at the time of tracking servo-off and the situation of the pit at that time are shown in drawing 1 . In drawing 1 , a sign 1 is a playback RF signal and a sign 2 is in the situation of the pit on a disk. At the time of tracking servo-off, in the time of the off-track shifted, RF-signal signal level differs greatly, and the level of a playback RF signal becomes large at the time of an on-truck, and it becomes smaller than the time of an on-truck from the time of the on-truck which hit the pit 2, and a pit 2 at the time of an off-track so that drawing 1 may show. What is necessary is to average only the level at the time of an on-truck for focal bias compensation. Then, it means arranging in descending the data of peak-to-peak level with which the playback RF signal was sampled, and carrying out averaging of the data only at the time of an on-truck by averaging only the level data of a high order.
[0012] The flow chart of focus servo ********** with which this invention is applied is shown in drawing 2 . Moreover, the subroutine flow chart of regulating [of the focal bias in the flow chart of drawing 2] automatically is shown in drawing 3 . Moreover, the flow chart of an example of the playback RF level measurement subroutine by sampling is shown in drawing 4 . First, the whole focus servo actuation is explained along with drawing 2 . If a flow chart starts at step 100, offset will be adjusted at step 101, a focus servo will be turned on at step 102, and a tracking servo will be made off. Next, focal bias compensation is performed by the approach shown in drawing 3 at step 103. Then, a tracking servo is turned ON at step 104, and if it confirms whether detection of a jitter is possible and is not detected at step 105, a detection location is changed at step 106 and it returns to step 103. When detection of a jitter is completed, focal bias is tuned finely and determined at step 107, further, tracking balance is adjusted at step 108, focal gain and tracking gain are determined at step 109, and focus servo actuation is ended at step 110.
[0013] Next, along with drawing 3 , the subroutine of focal bias compensation in step 103 is explained. If this subroutine starts at step 200, focal bias will be changed to a unit 5% at step 201 from -20% of current value to +20% of value. Then, playback RF level is measured by the approach of this invention shown in drawing 4 at step 202 to that each bias of a focus. Then, the point of focal bias with which playback RF level serves as max by 203 among the focal bias of 5% unit from -20% of steps to +20% is chosen. Here, when there are two or more points with which playback RF level serves as max, the bias near 0% is chosen. Then, it is decided that it will be the value of the point which had focal bias chosen at step 204, and this subroutine is ended at step 205.
[0014] Next, along with drawing 4 , the subroutine of playback RF level measurement at step 202 is explained. If this subroutine starts at step 300, spacing of 40ms of playback RF level data will be sampled 400 times at step 301. Then, the average of the data of 32 high orders is calculated at step 302 out of these 400 sampling data. However, except the data of the two most significants and they are not used in order to avoid the effect of a pulse-noise. Then, this average value is made into the playback RF level central value at this measurement time at step 303, and this subroutine is ended at step 304.
[0015] In this invention, by choosing the level at the time of an on-truck automatically, and changing a focal bias value by making the average value into playback RF level central value by choosing the large sampling value of playback RF level in this way, the focal bias value to which playback RF level central value becomes large most is found, and it is made into the focal bias best point. It becomes possible to choose the best focal bias value automatically and to set it up correctly, by this, for a short time.
[0016] As mentioned above, although the focal bias-compensation approach of the optical disk unit of this invention was explained, also let an optical disk unit equipped with a sampling means of playback RF signal level by which such a focal bias-compensation approach is realizable, and a high order value average means to compute the average value of the high order value in the sampled playback RF signal level be the object of this invention.
[0017]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The explanatory view showing the playback RF signal wave form at the time of tracking servo-off, and the situation of the pit at that time.
[Drawing 2] The flow chart of focus servo ********** with which this invention is applied.
[Drawing 3] The flow chart of the subroutine of focal bias regulating [of this invention] automatically.
[Drawing 4] The flow chart of the playback RF level measurement subroutine by the sampling of this invention.
[Description of Notations]
1 -- A playback RF signal, 2 -- Situation of the pit on a disk.

[Translation done.]

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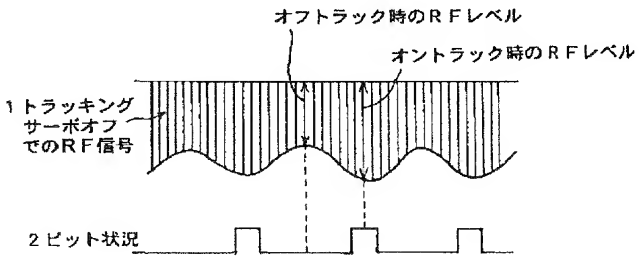
Ｆターム(参考)　5D118 AA13 BA01 CA26 CB03 CD08
CD11

(54)【発明の名称】　光ディスク装置および光ディスク装置のフォーカスバイアス調整方法

(57)【要約】
【課題】　短時間に、正確にフォーカスバイアスの自動調整が可能な光デスク装置の実現を課題とする。
【解決手段】　再生ＲＦ信号のレベルに基づいてフォーカスバイアスの自動調整を行う調整手段を有する光デスク装置において、調整手段に再生ＲＦ信号レベル１を複数回サンプリングするサンプリング手段と、このサンプリング手段によって複数回サンプリングされた再生ＲＦ信号レベル１中の上位値複数個の平均値を算出する上位値平均手段とを設け、この上位値平均手段が算出した平均値が最も大きくなるフォーカスバイアス値を調整値として用いる。



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【特許請求の範囲】

【請求項１】　再生ＲＦ信号のレベルに基づいてフォーカスバイアスの自動調整を行う調整手段を有する光デスク装置において、

前記調整手段は、前記再生ＲＦ信号レベルを複数回サンプリングするサンプリング手段と、

このサンプリング手段によって複数回サンプリングされた前記再生ＲＦ信号レベル中の上位値複数個の平均値を算出する上位値平均手段とを有し、

この上位値平均手段が算出した平均値が最も大きくなるフォーカスバイアス値を調整された値として採用することを特徴とする光ディスク装置。

【請求項２】　再生ＲＦ信号のレベルに基づいてフォーカスバイアスを自動調整する光デスク装置のフォーカスバイアス調整方法において、

前記再生ＲＦ信号レベルを複数回サンプリングするサンプリング過程と、

このサンプリング過程で複数回サンプリングされた前記再生ＲＦ信号レベル中の上位値複数個の平均値を算出する上位値平均過程と、

この上位値平均過程で算出する平均値が最も大きくなるフォーカスバイアス値を調整された値として採用するフォーカスバイアス値選択過程とを有することを特徴とする光ディスク装置のフォーカスバイアス調整方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、光デスク装置および光ディスク装置のフォーカスバイアス調整方法に関し、特にフォーカスバイアスの調整精度が高く調整に要する時間を短くできる光デスク装置および光ディスク装置のフォーカスバイアス調整方法に関する。

【０００２】

【従来の技術】光ディスク装置の光信号読み取りブロックは、精度良くレーザビーム収束を行い、レーザスポットをディスク面で合焦点状態とするために、フォーカス方向の焦点調整いわゆるフォーカスバイアス調整を、装置の組み立て時に機器ごとにメカ的な調整方法で行っている。さらに、実際の光ディスク装置においては、ディスク毎にフォーカスバイアスの電気的な調整も併せて行っている。

【０００３】通常、光ディスク装置としてのフォーカスバイアス調整はフォーカスサーボループおよびトラッキングサーボループを閉じ、光信号読み取りブロックに設けられた検出器が検出する再生ＲＦ信号のピークトゥピーク振幅が大きくなり、信号読取の状況（エラー状況等）が良くなるように調整することによって行っている。しかし、光信号読み取りブロックの光学的な方式によっては、トラッキングサーボの引きこみが光信号読み取りブロックでの調整精度を上げないと難しい場合がある。

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【０００４】そこで、トラッキングサーボループを引きこむ前にフォーカスバイアス調整を行う方法があるが、この段階でフォーカスバイアス調整を行うためには、トラッキングサーボをまだ引きこんでいないために、ジッタの測定（３Ｔレベル等の測定）は難しく、これが調整精度が上がらない原因となっていた。

【０００５】

【発明が解決しようとする課題】上述のごとく、従来の光デスク装置のフォーカスバイアス調整はトラッキングサーボループを引きこむ前に再生ＲＦ信号の振幅を基に行われる場合が多いが、ディスクの偏芯や面振れによって再生ＲＦ信号の振幅はレベルの変調を受けるため、正確なレベル測定は難しく、調整に時間がかかるという問題があった。本発明は、比較的簡単な方法でこの問題を解決して、比較的短時間に、正確にフォーカスバイアスの自動調整が可能な光デスク装置および光デスク装置のフォーカスバイアス調整方法の実現を課題とする。

【０００６】

【課題を解決するための手段】上記課題を達成するため、本発明は、再生ＲＦ信号のレベルに基づいてフォーカスバイアスの自動調整を行う調整手段を有する光デスク装置において、前記調整手段は、前記再生ＲＦ信号レベルを複数回サンプリングするサンプリング手段と、このサンプリング手段によって複数回サンプリングされた前記再生ＲＦ信号レベル中の上位値複数個の平均値を算出する上位値平均手段とを有し、この上位値平均手段が算出した平均値が最も大きくなるフォーカスバイアス値を調整された値として採用することを特徴とする。これにより、フォーカスバイアスの自動調整のための処理を簡単にして、短時間で正確にフォーカスバイアスの自動調整が可能な光デスク装置を実現することができる。

【０００７】また、再生ＲＦ信号のレベルに基づいてフォーカスバイアスを自動調整する光デスク装置のフォーカスバイアス調整方法において、前記再生ＲＦ信号レベルを複数回サンプリングするサンプリング過程と、このサンプリング過程で複数回サンプリングされた前記再生ＲＦ信号レベル中の上位値複数個の平均値を算出する上位値平均過程と、この上位値平均過程で算出する平均値が最も大きくなるフォーカスバイアス値を調整された値として採用するフォーカスバイアス値選択過程とを有することを特徴とする。これにより、フォーカスバイアスの自動調整のための処理を簡単にして、短時間で正確にフォーカスバイアスの調整が可能な光デスク装置のフォーカスバイアス調整方法を実現することができる。

【０００８】

【発明の実施の形態】以下、本発明にかかる光ディスク装置および光ディスク装置のフォーカスバイアス調整方法を添付図面を参照にして詳細に説明する。

【０００９】まず、本発明の光ディスク装置のフォーカスバイアス調整方法について説明する。以上にのべてき

たように、通常、セットでのフォーカスバイアス調整はフォーカスサーボループ、トラッキングサーボループを閉じ、光信号読み取りブロックに設けられた検出器が検出する再生ＲＦ信号のピークトゥピーク振幅が大きくなり、信号読取の状況（エラー状況等）が良くなるように調整することによって行っている。しかし、光信号読み取りブロックの光学的な方式によっては、トラッキングサーボの引きこみが光信号読み取りブロックでの調整精度を上げないと難しい場合がある。

【００１０】この問題を避けるために、トラッキングサーボループを引きこむ前にフォーカスバイアス調整を行う方法が考えられるが、この段階ではトラッキングサーボをまだ引きこんでいないために、フォーカスバイアス調整を行うためのジッタの測定（３Ｔレベル等の測定）は難しい。したがって、再生ＲＦ信号の振幅を見てフォーカスバイアス調整を行う方法が一般的である。しかし、このようなトラッキングが行われていない場合では、ディスクの偏芯や面振れによってＲＦ信号の振幅はレベルの変調を受けるため正確なレベル測定は難しい。そこで、本発明では再生ＲＦレベルをサンプリングし、そのピークトゥピーク振幅データの上位値の平均をとることによってこの問題を回避することを狙っている。

【００１１】図１にトラッキングサーボオフ時の再生ＲＦ信号波形とその時のピットの状況とを示す。図１において、符号１は再生ＲＦ信号であり、符号２はディスク上のピットの状況である。図１から分かるように、トラッキングサーボオフ時はピット２にあたったオントラック時と、ピット２からはずれたオフトラック時とでは、ＲＦ信号信号レベルが大きく異なってきて、再生ＲＦ信号のレベルはオントラックの時に大きくなり、オフトラック時にはオントラック時よりも小さくなる。フォーカスバイアス調整のためには、オントラックの時のレベルだけを平均すれば良い。そこで再生ＲＦ信号のサンプリングされたピークトゥピークレベルのデータを大きい順に並べ、上位のレベルデータのみを平均することによってオントラック時のみのデータを加算平均したことになる。

【００１２】本発明が適用されるフォーカスサーボ自動調整ののフローチャートを図２に示す。また、図２のフローチャート中のフォーカスバイアスの自動調整のサブルーチンフローチャートを図３に示す。また、サンプリングによる再生ＲＦレベル測定サブルーチンの一例のフローチャートを図４に示す。まず、図２に沿って全体のフォーカスサーボ動作を説明する。ステップ１００でフローチャートがスタートすると、ステップ１０１でオフセットを調整し、ステップ１０２でフォーカスサーボをオンしてトラッキングサーボをオフとする。次に、ステップ１０３で図３に示す方法でフォーカスバイアス調整を行う。その後、ステップ１０４でトラッキングサーボをオンにして、ステップ１０５でジッタの検出が可能かどうかを確かめ、もし検出されなければステップ１０６で検出位置を変えてステップ１０３に戻る。ジッタの検出ができた場合は、ステップ１０７でフォーカスバイアスを微調整して決定し、さらに、ステップ１０８でトラッキングバランスを調整し、ステップ１０９でフォーカスゲイン、トラッキングゲインを決定してステップ１１０でフォーカスサーボ動作を終了する。

【００１３】次に、図３に沿って、ステップ１０３でのフォーカスバイアス調整のサブルーチンについて説明する。ステップ２００でこのサブルーチンがスタートすると、ステップ２０１でフォーカスバイアスを現在の－２０％の値から＋２０％の値まで５％刻みに変化させる。そうしてその各々のフォーカスバイアスに対してステップ２０２で図４に示す本発明の方法で再生ＲＦレベルを測定する。そうして、ステップ２０３で－２０％から＋２０％までの５％刻みのフォーカスバイアスのうち、再生ＲＦレベルが最大となるフォーカスバイアスのポイントを選択する。ここで、もし再生ＲＦレベルが最大となるポイントが複数あった場合は、０％に近いバイアスを選択する。そうして、ステップ２０４でフォーカスバイアスを選択されたポイントの値に決定し、ステップ２０５でこのサブルーチンを終了する。

【００１４】次に、図４に沿ってステップ２０２での再生ＲＦレベル測定のサブルーチンについて説明する。ステップ３００でこのサブルーチンがスタートすると、ステップ３０１で再生ＲＦレベルデータの４０ｍｓの間隔を４００回サンプリングする。続いて、この４００個のサンプリングデータの中から、ステップ３０２で、上位３２個のデータの平均値を計算する。ただし最上位２個のデータはパルス的なノイズの影響を避けるため除外して使用しない。そうしてステップ３０３で、この平均値をこの測定時点の再生ＲＦレベル代表値とし、ステップ３０４でこのサブルーチンを終了する。

【００１５】本発明では、このように、再生ＲＦレベルの大きいサンプリング値を選ぶことで、自動的にオントラックの時のレベルを選択し、その平均値を再生ＲＦレベル代表値として、フォーカスバイアス値を変化させることによって、最も再生ＲＦレベル代表値が大きくなるフォーカスバイアス値を見つけて、それをフォーカスバイアス最良点とする。これにより、短時間で正確に最良のフォーカスバイアス値を自動的に選び、設定することが可能になる。

【００１６】以上、本発明の光ディスク装置のフォーカスバイアス調整方法について説明したが、このようなフォーカスバイアス調整方法を実現できる、再生ＲＦ信号レベルのサンプリング手段と、サンプリングされた再生ＲＦ信号レベル中の上位値の平均値を算出する上位値平均手段とを備える光ディスク装置も、本発明の対象とするものである。

【００１７】

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【発明の効果】以上説明したように本発明の請求項１の発明は、再生ＲＦ信号のレベルに基づいてフォーカスバイアスの自動調整を行う調整手段を有する光デスク装置において、調整手段に再生ＲＦ信号レベルを複数回サンプリングするサンプリング手段と、サンプリングされた再生ＲＦ信号レベル中の上位値複数個の平均値を算出する上位値平均手段とを設け、この算出された平均値が最も大きくなるフォーカスバイアス値を調整値として採用することを特徴とする。これにより、フォーカスバイアスの調整精度を向上することができ、正確なフォーカスバイアスの自動調整が可能で、それに伴って、フォーカスゲインの自動調整、トラッキングゲイン自動調整の精度も向上することが可能な光デスク装置を実現することができ、さらに、フォーカスバイアスの自動調整のための処理が簡単になることからフォーカスバイアスの自動調整の時間を短縮することが可能な光デスク装置を実現することができる。

【００１８】請求項２の発明は、再生ＲＦ信号のレベルに基づいてフォーカスバイアスを自動調整する光デスク装置のフォーカスバイアス調整方法において、再生ＲＦ信号レベルを複数回サンプリングするサンプリング過程と、このサンプリング過程でサンプリングされた再生Ｒ＊

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＊Ｆ信号レベル中の上位値複数個の平均値を算出する上位値平均過程と、この上位値平均過程で算出した平均値が最も大きくなるフォーカスバイアス値を調整値として採用するフォーカスバイアス値選択過程とを有することを特徴とする。これにより、フォーカスバイアスの調整精度を向上することができ、正確なフォーカスバイアスの自動調整が可能で、これに伴って、フォーカスゲインの自動調整、トラッキングゲイン自動調整の精度も向上することが可能であり、フォーカスバイアスの自動調整の時間を短かくすることができる光デスク装置のフォーカスバイアス調整方法を実現することができる。

【図面の簡単な説明】

【図１】トラッキングサーボオフ時の再生ＲＦ信号波形とその時のピットの状況を示す説明図。

【図２】本発明が適用されるフォーカスサーボ自動調整ののフローチャート。

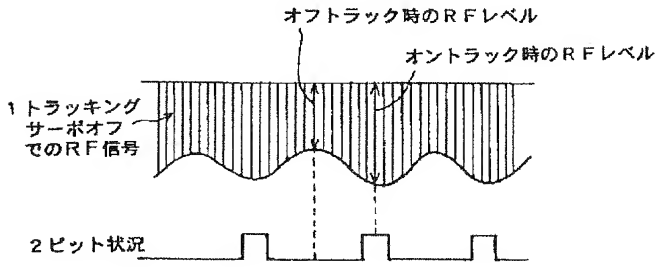
【図３】本発明のフォーカスバイアス自動調整のサブルーチンのフローチャート。

【図４】本発明のサンプリングによる再生ＲＦレベル測定サブルーチンのフローチャート。

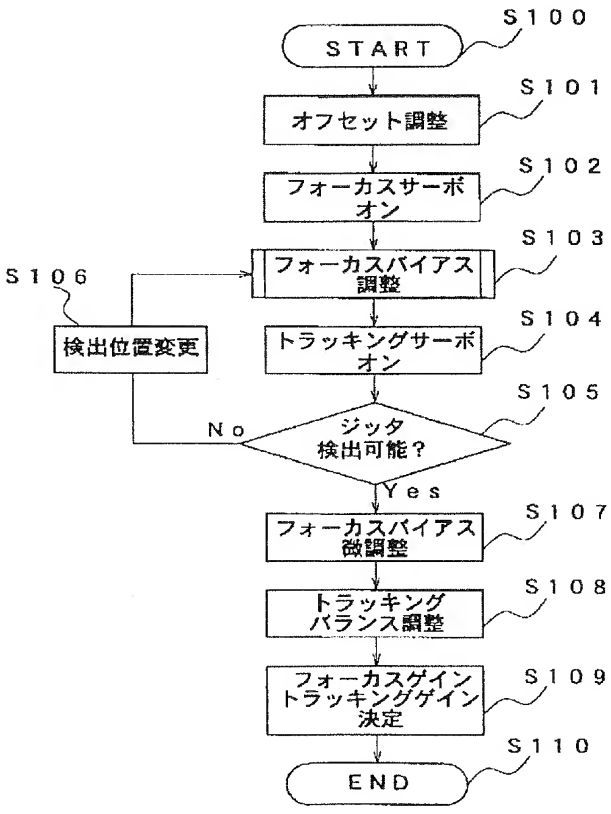
【符号の説明】

１…再生ＲＦ信号、２…ディスク上のピットの状況。

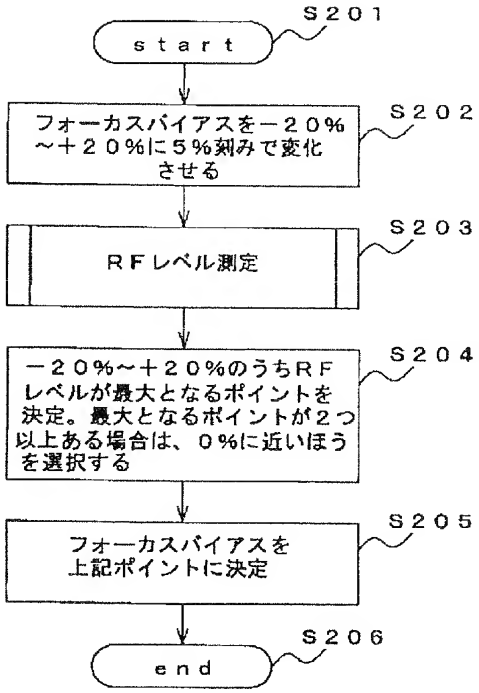
【図１】



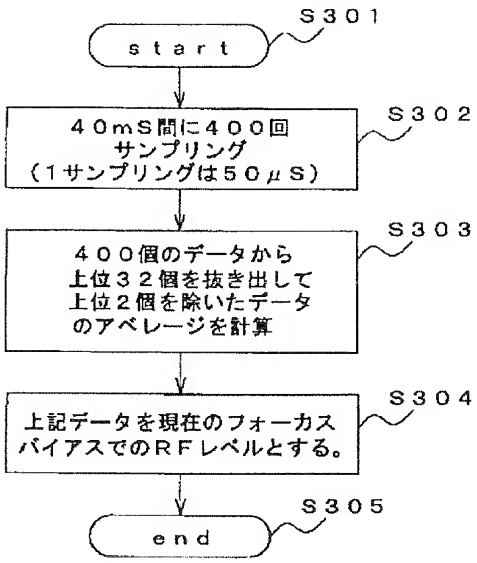
【図２】



【図３】


S201
start
フォーカスバイアスを－２０％～＋２０％に５％刻みで変化させる
S202
S203
ＲＦレベル測定
S204
－２０％～＋２０％のうちＲＦレベルが最大となるポイントを決定。最大となるポイントが２つ以上ある場合は、０％に近いほうを選択する
S205
フォーカスバイアスを上記ポイントに決定
S206
end

【図４】


S301
start
４０ｍＳ間に４００回サンプリング（１サンプリングは５０μＳ）
S302
S303
４００個のデータから上位３２個を抜き出して上位２個を除いたデータのアベレージを計算
S304
上記データを現在のフォーカスバイアスでのＲＦレベルとする。
S305
end